

1 Claims

1. A method for attaching solder balls to a substrate having conductive pads in a predetermined pattern comprising:

- 5 providing a carrier for the substrate;
 inserting the substrate into the carrier;
 providing an alignment plate comprising a plurality of through-holes in a pattern which corresponds to the predetermined pattern of the conductive pads of the substrate; said through-holes having a diameter slightly larger than the diameter of the solder balls;
10 placing the alignment plate over the substrate so that the through-holes of the alignment pad are aligned directly above the conductive pads of the substrate;
 inserting a solder ball into each hole of the alignment plate whereby each solder ball falls into contact with a conductive pad of the substrate;
 heating the alignment plate and substrate sufficiently to at least partially melt the solder balls;
15 cooling the alignment plate and substrate sufficiently to resolidify the solder balls which bond to the conductive pads of the substrate in the predetermined pattern; and
 removing the alignment plate; and
 removing the substrate from the holder.

20 2. An apparatus for attaching solder balls to a substrate having a plurality of conductive pads in a predetermined pattern comprising:

- a carrier for the substrate;
 an alignment plate comprising a plurality of through-holes in a pattern corresponding to the predetermined pattern of the conductive pads of the substrate;
25 means for inserting a solder ball having a diameter slightly less than the diameter of the through-holes of the alignment plate into each hole of the alignment plate;
 means for heating the alignment plate and substrate to a temperature sufficient to melt at least the surface of the solder balls.

30 3. A substrate comprising a plurality of solder ball interconnects fixedly attached to the surface of the substrates wherein the solder ball interconnects have a shape comprising a generally spherical head region and a curved neck region between the head region and the substrate surface, the minimum diameter of the neck region being smaller than the maximum diameter of the head region.

1 4. A substrate as claimed in claim 3 wherein the variance in the coplanarity of the
solder ball interconnects is less than 10% of the average height of the solder ball interconnects.

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